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Status of the Cypress Minnow, *Hybognathus hayi* Jordan, in Illinois.

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ABSTRACT

The discovery of six previously unpublished distributional records for a rare cyprinid, *Hybognathus hayi*, in Illinois, documents that the species was more common and widespread than what recent literature indicates. The species has been considered to be extirpated in Illinois, but presumably suitable habitat is present in the Cache and Big Muddy River systems and the possibility that *H. hayi* still occurs in southern Illinois is considered. Morphological characters that distinguish *H. hayi* from its relative *H. nuchalis* are presented.

INTRODUCTION

The cypress minnow, *Hybognathus hayi* Jordan, is one of the rarest members of the Illinois fish fauna, and is presently considered to be extirpated (Smith, 1979), having not been collected in the state since 1940. Because of this status, *H. hayi* was not included on the Illinois Department of Conservation's list of endangered and threatened species (Kenney, 1978). The species reached the northernmost periphery of its range in Illinois and is apparently uncommon and disappearing in other areas on the edges of its range (e.g., Indiana, Missouri, Oklahoma, Florida). Heretofore, the only published record of the cypress minnow in Illinois was from the Little Muddy River drainage (Smith, 1979) and was based on specimens collected in 1940 by Aden C. Bauman [not Milton B. Trautman as stated in Smith (1979)]. However, in the late 1930's and 1940, Aden C. Bauman (then a student at the University of Michigan Museum of Zoology), Milton B. Trautman and their associates collected *H. hayi*, sometimes in large numbers, from six additional localities in southern Illinois. It is the purpose of this paper to formally report additional collections of *H. hayi* in Illinois and present characters that will aid in differentiating *H. hayi* from its more common and widespread relative in Illinois, the silvery minnow, *H. nuchalis* Agassiz.

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METHODS

Fingerman and Suttkus (1961) compared *H. hayi* and *H. nuchalis* from specimens collected in Mississippi and Louisiana and presented some meristic, pigmentary and morphometric characters for distinguishing the two species. Because the two species are so similar in external meristic characters our study concentrated on some body proportions and vertebral counts as additional aids in differentiating the two. Measurements, taken with dial calipers to the nearest 0.1 mm, followed Hubbs and Lagler (1964) except as follows. Mouth-to-eye-distance is the vertical distance from top of bony orbit to an imaginary line running posterior from the junction of the premaxilla and mandible. Vertebral counts were taken from radiographs and included the Weberian apparatus as four and the urostyle as one. The first vertebra with a well developed haemal spine was considered to be the first caudal element; all those anterior were considered trunk vertebrae. The number of vertebrae anterior to the first pterigiophore of the first dorsal fin ray are referred to as the dorsal insertion.

MATERIAL EXAMINED

The following material examined includes complete collection data for all known specimens of *H. hayi* from Illinois and collections of *H. nuchalis* used for comparative purposes. Numbers of specimens examined are in parentheses followed by their range in standard length in millimeters. Institutional acronyms are identified in Acknowledgments.

Hybognathus hayi

ILLINOIS. Pulaski County: UMMZ 205316, cypress pond (Cache drainage), 2.4 km S Perks, 31 August 1940, Aden C. Bauman (1, 45); UMMZ 205317, drainage ditch (Cache drainage), 1.6 km N, 3.2 km W Karnak, 31 August 1940, Aden C. Bauman (6, 40-84). Union County: UMMZ 105958, McCann's bar pit (Clear Creek drainage), near Aldridge, 25 September 1937, Aden C. Bauman and George Harry (6, 60-81). Perry-Washington County: UMMZ 205318, Beaucoup Creek (Big Muddy drainage), 9.6 km W Du Bois, 6 September 1940, Aden C. Bauman (46, 57-82). Washington County: UMMZ 163019, Little Muddy River (Big Muddy drainage), 1.6 km E DuBois, 6 September 1940, Aden C. Bauman (32, 45-97). Jefferson County: UMMZ 163051, Little Muddy River (Big Muddy drainage), 8 km E Tamaroa, September 1940, Aden C. Bauman (37, 47-90). Alexander County: UMMZ 111602, below Horseshoe Lake Dam (Mississippi drainage), 3.2 km S Olive Branch, 14 June 1936, Milton B. Trautman and David H. Thompson (7, 65-78).

Hybognathus nuchalis

ILLINOIS. Menard County: INHS 15236, Sangamon River (Illinois drainage), 3.2 km N Oakford, 23 July 1968, R. Rogers et al. (15, 24-34). Edgar County: INHS 2893, Brouillets Creek (Wabash drainage), 3.2 km SE Christian, 26 June 1961, P. W. Smith and Martorano (3, 88-91). Logan County: INHS 18674, Salt Creek (Sangamon drainage), 1.6 km S

Lincoln, 30 September 1971, D. Rogers et al. (2, 83-93). White County: INHS 9432, Wabash River (Ohio drainage) at Maunie, 6 September 1961, P. W. Smith and von Neumann (20, 45-69). Clark County: INHS 2560, Big Creek (Wabash drainage), 8 km SE Marshall, 2 July 1950, P. W. Smith and D. W. Bridges (20, 56-82).

COMPARISON OF *H. hayi* AND *H. nuchalis*

The genus *Hybognathus* is a taxonomically difficult group and until recently, was comprised of four species (*hankinsoni* Hubbs, *hayi*, *nuchalis*, and *placitus* Girard). Recent workers (Bailey, 1954; Al-Rawi and Cross, 1964; Pflieger, 1971) consider *H. argyritis* Girard [formerly placed in the synonymy of *H. nuchalis*] and *H. regius* Girard [formerly a subspecies of *H. nuchalis*] to be valid species, bringing the total number of species to six. Members of the genus are mostly silvery or brassy in color, have long, coiled intestines and reach a maximum of about 150 mm total length. Characters used in differentiating species of *Hybognathus* are mostly those of body proportions (e.g., snout length, eye size), pigmentation patterns, some meristic features and the shape of the basioccipital process (Niazi and Moore, 1962; Al-Rawi and Cross, 1964; Bailey and Allum, 1962; Pflieger, 1971).

Five species of *Hybognathus* (all but *regius*) are found in Illinois (Smith, 1979) but *H. hayi* is sympatric only with *H. nuchalis*, and only once have the two species been found together (Horseshoe Lake Dam, UMMZ 111602). The following are some meristic characters that serve to characterize *H. hayi* but nevertheless overlap with *H. nuchalis*. *H. hayi* has a 0,4-4,0 pharyngeal tooth count; 8 anal fin rays; 9-13 body-circumferential scale rows above the lateral line; 10-15 body-circumferential scale rows below the lateral line; and 34-41 lateral-line scales (Fingerman and Suttikus, 1961).

Body shape and proportions and scale shape and pigmentation patterns seem to be more useful in distinguishing between the two species. When compared with *H. nuchalis*, *H. hayi* has a more compressed (vs. subterete) body; an angular profile (vs. a rounded profile); a more distinctly diamond-shaped pigmentary pattern to the scales; melanophores on the anterior part of the lateral band are small (vs. large) and only slightly larger (vs. noticeably larger) than those on the upper parts of the sides and back; the median dorsal stripe in front of the dorsal fin narrower and lighter; a relatively much shorter intestine in proportion to the standard length; a more broadly rounded snout that does not project anteriorly beyond the upper lip; a more upturned mouth; a larger eye; and more anteriorly placed dorsal and anal fins.

When comparing body proportions between the two species we found two characters that result in 100% accurate identifications. At all sizes, *H. nuchalis* has a greater mouth-to-eye-distance than *H. hayi* (Fig. 1). The measurement of the length from the anal fin origin to the caudal base is greater in *H. hayi* than in *H. nuchalis* (Fig. 2), illustrating the more anteriorly placed anal fin in *H. hayi*. In adults, *H. nuchalis* has a longer snout than *H. hayi* (Fig. 3), however, the character overlaps at smaller sizes and is subject to allometric change.

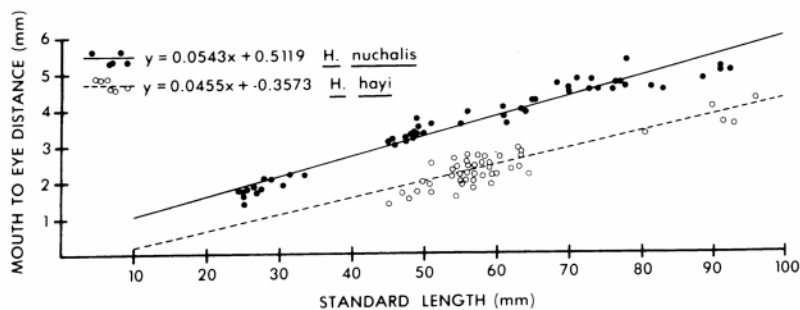


Fig. 1. Regression of mouth-to-eye-distance on standard length in *H. hayi* and *H. nuchalis*.

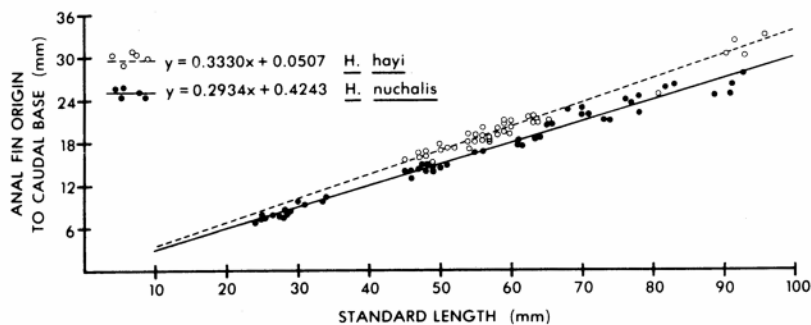


Fig. 2. Regression of distance from anal fin origin to caudal base on standard length in *H. hayi* and *H. nuchalis*.

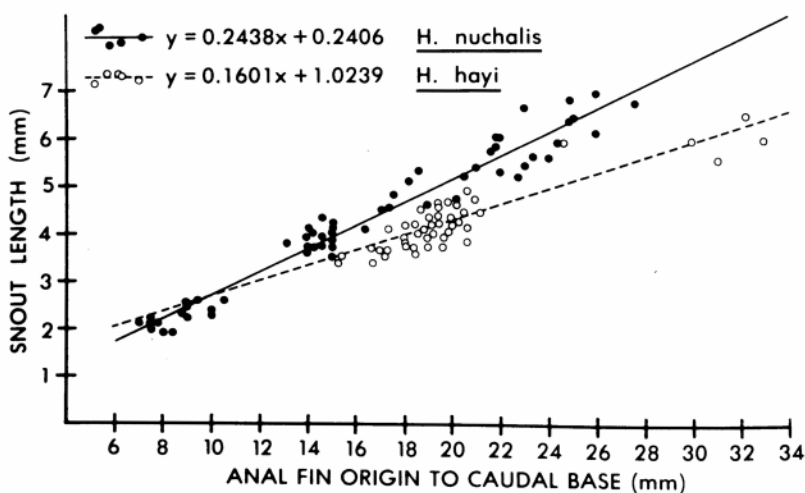


Fig. 3. Regression of snout length on distance from anal fin origin to caudal base in *H. hayi* and *H. nuchalis*.

Table 1. Numbers of vertebrae (including the Weberian apparatus as four and the urostylar vertebra as one) in two species of *Hybognathus*. Based on specimens from Illinois (see Material Examined).

Species	Dorsal Insertion					Trunk					Caudal					Total				
	10	11	12	\bar{X}	18	19	20	21	\bar{X}	17	18	19	20	\bar{X}	37	38	39	\bar{X}	N	
<i>H. hayi</i>	15	43	2	10.8	6	47	7	—	19.0	—	12	44	4	18.9	13	41	6	37.9	60	
<i>H. nuchalis</i>	1	25	23	11.5	—	1	41	7	20.1	14	32	3	—	17.8	10	34	5	37.9	49	

The two species overlap in vertebral counts (Table 1), but show average differences in numbers of trunk and caudal vertebrae and vertebrae anterior to the dorsal fin insertion. *H. hayi* averages fewer trunk and more caudal vertebrae than *H. nuchalis*. Our counts for trunk and caudal vertebrae differ slightly from those given by Fingerman and Suttkus (1961). Differences observed may be attributable to geographic variation, although determination of the first vertebral element with a well developed haemal spine could also account for the discrepancies.

DISTRIBUTION AND HABITAT

Hybognathus hayi ranges from the western panhandle of Florida to eastern Texas, north to Illinois and Indiana and is found largely within the Coastal Plain boundary, except in Illinois and Indiana, where that boundary is transcended (Fig. 4, insert map). The species occurs primarily in sluggish backwaters of streams or cypress lakes and prefers a soft bottom, usually sand overlain with silt and detritus or mud.

In Illinois, *H. hayi* was collected in the late 1930's and 1940 during the summer months from seven localities (Fig. 4) including the Big Muddy, Cache, Clear Creek and Horseshoe Lake drainages. Aden C. Bauman recorded the habitat of *H. hayi* from six of the seven localities in Illinois, generally as follows: water warm and clear, but not flowing; accumulations of logs, brush and other debris; soft mud bottom and weedy banks; submerged aquatic vegetation lacking; water level generally 0.5 m deep. He further recorded sinking about 20 cm into the mud while seining at several sites.

One additional collection of *H. hayi* (USNM 76765) from Illinois was made by Robert Ridgeway. No date or other locality data were recorded for the three (71-76 mm SL) specimens. We presume the specimens were collected in the Wabash drainage because that is the area where Ridgeway spent much of his life.

CONSERVATION STATUS

The cypress minnow has not been collected in Illinois since Bauman's last collection in 1940 and thus it is presently considered to be extirpated in the state. Significantly, the cypress minnow appears to be disappearing or sporadic in occurrence in several other parts of its range. The situation in Missouri was much like that for Illinois, in that the cypress minnow had not been collected there since the early 1940's and was considered to be rare and possibly extirpated (Pflieger, 1975; Nordstrom, et al., 1977). However, *H. hayi* was recently (1979) collected in southeastern Missouri (W. L. Pflieger, pers. comm.). The cypress minnow has not been collected from Indiana since the early 1940's (Gerking, 1945), but to our knowledge no one has made an attempt to look for it there. In Arkansas, the species is of indeterminate status, because not enough is known about its distribution and abundance (Buchanan, 1974) for clarification of its status. In Kentucky, *H. hayi* was also placed in the indeterminate category (Babcock, 1977) but has recently been shown to be more common than formerly thought (Burr, et al., 1980). It has been collected once

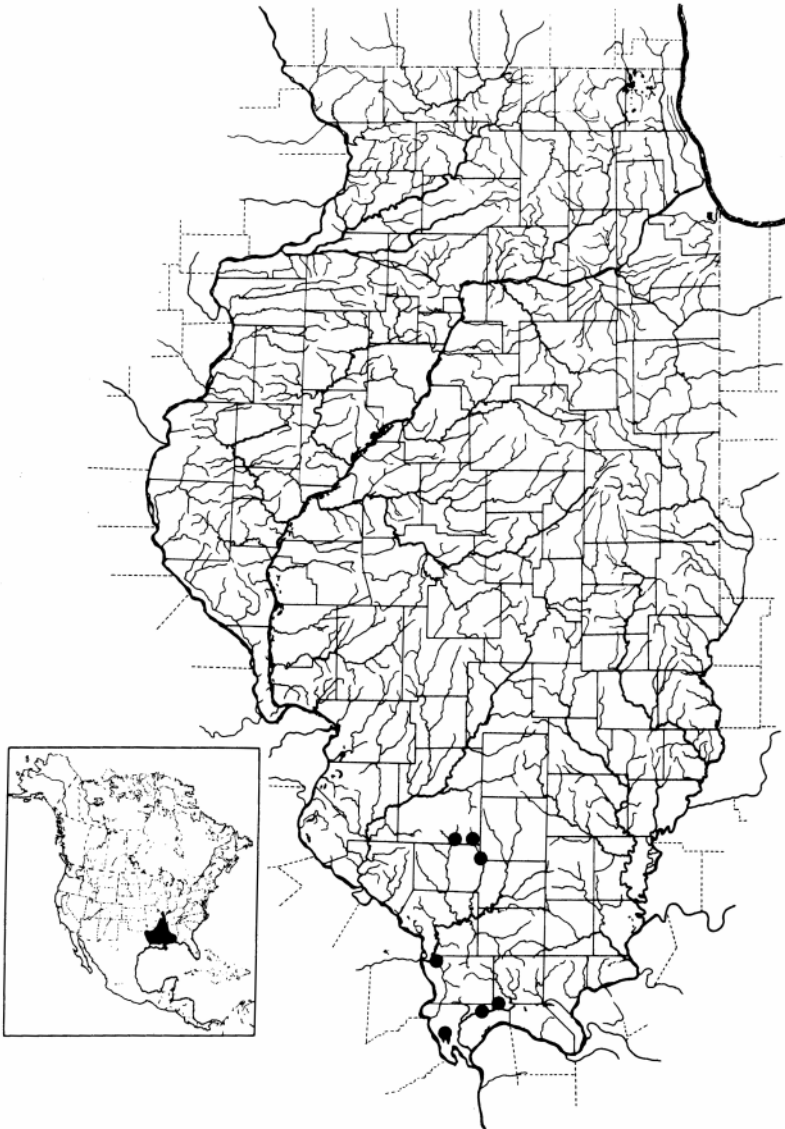


Fig. 4. Distribution of *H. hayi* in Illinois based on specimens examined. Inset map represents total range of species.

from the Mountain Fork River drainage in southeastern Oklahoma (Miller and Robison, 1973) and thus is presumably rare in that state. Finally, *H. hayi* is on the threatened list in Florida (Gilbert, 1978) because of its limited distribution in the western panhandle. Otherwise, the species is reported to be sporadic but more evenly distributed in the central parts of its range (e.g., Mississippi, Tennessee, Alabama, Texas and Louisiana).

It has been clearly demonstrated that the fish fauna of Illinois has undergone rapid and drastic changes in the last 80 years (Smith, 1971; 1979), and most of the factors responsible for the extirpation or decimation of native Illinois fishes are the result of environmental changes brought on by man (e.g., excessive siltation, stream channelization, pollution, and impoundments). Smith (1979) stated that the drainage (Little Muddy River), from which he reported *H. hayi* suffered from oil field pollution.

We revisited the seven sites the cypress minnow was known from in an attempt to obtain specimens, but our seining efforts did not reveal the presence of the species. However, we were impressed by the large numbers of species present at the sites and the overall abundance of individuals. In comparing our collections with those of Bauman we note that the basic composition of the species present at the sites has changed little in the last 40 years. Significantly, however, we note the absence in our collections of *Notropis emiliae* (Hay) and *H. hayi*, both of which were collected by Bauman, and the presence of the aggressive *Notropis lutrensis* (Baird and Girard), a species Bauman did not collect at any of the sites. The distribution of *N. emiliae* in Illinois has shown a drastic change in recent decades (Smith, 1971) when compared to collections made at the turn of the century (Forbes and Richardson, 1920). The reduction in range of *N. emiliae* in Illinois is probably due to increased siltation and loss of aquatic vegetation (Smith, 1971), factors that undoubtedly have played some role in the decimation of *H. hayi*. Noteworthy, too, is the rapid spread of *N. lutrensis* in Illinois, probably due to increased turbidity of the water, which has in the last 80 years caused a reduction in range of a close relative, *N. spilopterus* (Cope) (Page and Smith, 1970).

The range of *H. nuchalis* in Illinois also shows signs of decimation, despite its abundance in some streams. Smith (1971, 1979) attributed this decimation to siltation, pollution and widely fluctuating water levels, particularly reductions in stream sizes during droughts. These factors have probably also effected the presumed extirpation of *H. hayi* from Illinois.

Because Bauman's collections contained in some cases a rather large number of specimens of *H. hayi* and what appears to be suitable habitat for the species is still present in the Cache and Big Muddy rivers and around Horseshoe Lake, we feel that *H. hayi* may still be present, though rare, in Illinois. We recommend that further surveying of suitable areas be conducted in an attempt to find other localities for *H. hayi* in the state.

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